FAO Plant Protection Bulletin

VOL. II, No. 9 — A Publication of the — JUNE 1954

World Reporting Service on Plant Diseases and Pests

Some Important Diseases of Cacao

FREDERICK L. WELLMAN

United States Foreign Operations Administration, San José, Costa Rica [1]

THE tree, *Theobroma cacao*, that produces the beans from which cocoa and chocolate are made originated in the jungles of tropical America. The name cacao, applied to both the tree and its seeds in Latin America, originated from the pre-Colombian peoples in the Americas, who prepared from the bean a sacred and favorite drink. It has grown in popularity until it is now an important article of world diet.

With higher prices being realized from cacao there has come increased interest in its production, and disease problems are now being given more attention. The purpose of this paper is to present short discussions of some of the more important troubles of the crop. It should be pointed out that there is an increasing anxiety for countries to place dependence for their commerce on more than one crop, and the interest in cacao is partly for this reason. There are several countries where coffee is almost the exclusive source of foreign currency, and reliance upon one crop for such a vital thing as the life of a whole nation, is realized as risky. Where coffee-producing countries have areas in which they can grow cacao, there is a tendency to develop this second crop.

In any case cacao has become a substantial commodity in international trade. Huge fortunes have been built upon it, and, because of occasional misfortune, fortunes have been lost. Sometimes in the past this misfortune has been due to world economics, but more dramatic losses in cacao have been due to diseases.

[1] Formerly with Foreign Agricultural Service, United States Department of Agriculture.

Witches' Broom Disease

Witches' broom is caused by a fungus parasite, *Marasmius perniciosus*, which attacks only cacao. It appeared in Dutch Guiana in 1895 in an area which had produced nearly ten million pounds of cacao beans. So rapidly did the disease spread that within nine years the crop was reduced to less than two million pounds. In Ecuador, witches' broom brought losses that amounted to a national calamity. It is still the most potent limiting factor in most cacao areas of South America, but does not occur in Central America or the Oriental or African tropics. The spores of the fungus infect any newly developing cacao tissues and cause monstrosities. Large numbers of fruits are infected and grow into dwarfed, conical, hump-shaped, hardened pods, which produce nothing and wither on the tree.

Brooming reaction consists of curvature and rapid expansion of stem tissues and normally dormant side buds, gigantic leaf stipules, small and limp leaves, strangely shaped abortive flowers of mammoth size, malformed flower cushions. At first the brooms are highly succulent, but they usually die within a month. With the coming of intermittent rains, the killed tissues of fruits or brooms, on the ground or in the tree, develop small, irregular toadstools, which, stimulated by slight drops in the air temperature, produce millions of spores.

Recent research in several countries has advanced our knowledge of the fungus, the disease and its control. Technicians of the United States and other countries, working together have played a leading

part. Scientists in Ecuador have acquired further information on the life history of the causal organism by using rapid seedbed and laboratory methods of infecting plants. Using laboratory tests and studies in plantations, they have been making progress in treating cacao with phenolic and cresylic spray compounds. Quick, standardized tests help them to determine resistance to the disease, the basis of a program of selection and breeding better varieties. For many years field workers in Trinidad and elsewhere have been searching for resistant cacao clones. Clonal plantation is rapidly being developed to ensure the perpetuation of desirable selections.

Swollen Shoot

Swollen shoot disease was first identified in West Africa in 1936, although six years earlier excessive dieback, now known to be an ultimate symptom, had attacked trees. The disease is mainly confined to the Gold Coast, Cameroons, and Nigeria in Africa and is considered the most dangerous one to attack cacao in that continent. Losses have been catastrophic. The area where it was first studied comprised about 250,000 acres and within nine years after its discovery it had killed more than half of the mature trees. It has since spread to other regions in Africa. Left alone, the disease could destroy the cacao industry in Africa and could readily be introduced into the Western Hemisphere with similar results.

The disease is caused by a virus, of which several strains exist. All apparently are indigenous to certain African jungle trees. It is carried by sucking insects, some of which are well distributed in both the African and the American tropics. Other viruses exist on cacao in tropical America but they have caused relatively minor disturbance.

The severe strains of the swollen shoot virus cause abnormal swellings on infected shoots or branches. Symptoms that may precede or follow swelling are red veining of young leaves, a yellowish spotting in the leaf blade, vein clearing, leaf crinkling, and necrosis of leaf edge and tip. Pods on the less seriously attacked trees are rounded and small with mottling and other mosaic markings on their surfaces. As the disease becomes severe, no fruit is produced, defoliation and dieback result, and the tree dies.

A control used for the disease is isolation of the affected areas. Countries of the Western Hemisphere have tried to develop quarantines that will keep the disease from being carried to their plantations. The best way to limit spread of the virus thus far has been to rogue out diseased trees, by cutting them down below the ground line so that they cannot sprout again, and to remove apparently healthy trees that are in contact with diseased trees. The method is costly and has caused much disturbance among small peasant farmers, even where compensation has been paid for trees removed. In places where it has been adequately carried out, however, it has been effective.

Scientists at the West African Cocoa Research Institute in the Gold Coast, have concentrated their efforts on determining the properties and activities of the virus, on inducing resistance by use of pre-inoculations with mild protective types of the virus, and on eliminating the insect vectors. Many collections of cacao have been introduced and tested, and some headway has been made in the search for resistant varieties.

Black Pod or Pod Rot

Phytophthora rot occurs in most of the regions where cacao is grown and causes pods to decay. It is due to *Phytophthora palmivora* and was first reported in Trinidad in 1727 and in Ceylon in 1833. It is common throughout the American tropics, although, strangely, it rarely occurs in Ecuador. In Central America, Colombia and Brazil the rot is reported to have caused fruit losses as high as 30 to 60 percent. Attacks are most severe when low prices discourage growers to care for their trees. In badly neglected plantations 90 percent of the pods are destroyed. The causal fungus attacks many kinds of vegetables, fruits, and ornamentals in the tropics. It is especially adapted to moist regions and is most severe in rainy seasons. It is spread in cacao by wind, insects, man and most frequently of all by the dripping and splashing of water from surfaces of diseased spore-bearing cacao tissues.

Besides pod rot, the organism causes tree cankers, reddish, sunken lesions on

green stems, a general leaf decay and soft spots, and collapse of water sprouts. On pods, from the very youngest to the most mature, it causes a fast expanding, dark-brown or almost black rot. Edges of the decay form a distinct line. The diseased tissues, which are also brown inside, shrink. Crops can be picked from diseased trees if the ripe pods are harvested before the rot does much damage, but the decay eventually discolors the seeds and can destroy them. At best, it lowers the quality of their flavor. In wet weather rotted pods are covered with more or less scanty powdery white growths that bear the fungus spores.

Spores require moisture for their activity and cannot infect a dry surface. Cultural treatments that encourage rapid drying therefore help to stop pod rot.

Spraying is also used. Bordeaux mixture has been adopted against black pod in South America since 1910, when growers sprayed four times a year while the pods were young. In those early experiments untreated trees had 25 percent black pod; sprayed trees, 9 percent. Bordeaux also has since been used with good results there as well as elsewhere and in Central America. An intensive research program on this is now in progress in Costa Rica. Where conditions are most severe, monthly spraying may be necessary. Spraying in the tropics, especially with Bordeaux, raises special problems and tests are being made with numerous other newer fungicides.

It has been reported that different strains of cacao seem to show various degrees of resistance to black pod, and it is hoped that resistant or more tolerant varieties can be developed.

Monilia Pod Rot

A very serious pod decay due to *Monilia roreri* flourishes in Ecuador and in Colombia in districts where rainfall is high and in plantings where the shade is dense and air circulation is poor. As much as 75 percent of the crop in some areas is reported as lost from the disease. Occasionally it has destroyed the whole crop in a region. The spores that are produced in tremendous numbers germinate on moist pods but can penetrate into only very young pods, or old pods when ripe and wounded. When it enters new tissue the fungus grows internally with the developing pod. For a long time after it has penetrated the pod there is no shrinkage, swelling, or outward sign of its presence. Infected pods finally become irregular in shape and dark in color but show no lesion. At this point, the diseased immature green pods of yellow varieties are often blotched with yellow. Red young pods of red varieties may have orange markings. When cut open, those fruits show internal streaks and dark marbling, and the seeds are softened and may eventually become liquified. In later stages, pods exhibit large brown areas surrounded with yellow borders, from which moldy growth develops. Finally, the pod is wholly covered with a heavy, almost shaggy, white fungus mat, powdered with myriads of the buff-colored spores.

Much has still to be accomplished if the disease is to be successfully controlled. Investigations on control techniques are continuing, but thus far it is mostly a matter of improving growing conditions. With better culture, such as pruning and keeping shade to a reasonable minimum, there is less danger of infection from *Monilia*. Any practices designed to increase the vigor of the cacao tree and thus to shorten the time when pods are small and susceptible to infection are likewise recommended. It is also probable that the newer fungicides will give greater control of the disease. There is some evidence of considerable variation in resistance of cacao varieties and selections to *Monilia*, and search has been started for valuable clones with desirable *Monilia*-tolerant characteristics.

Anthracnose

Colletotrichum gloeosporioides, the fungus that causes anthracnose is one of the most widespread troubles of cacao. As a rule, anthracnose fruit spots have been of relatively negligible importance except as a source for the subsequent spread of the organism.

The organism is widespread and its many strains attack numerous crops in both the tropics and the temperate zones. The spots it causes on cacao leaves and succulent

stems are dark and definite. In young tissues the spots are usually small. Often they coalesce into larger areas and have a yellow halo. Under adverse circumstances of careless planting practices, in poor soils, with inadequate shading and excessive rainfall, beds of seedlings and rooted cuttings grown in infested soils often develop a condition called bare tip. The anthracnose organism repeatedly infects the stipules and the small unfolding leaves, and these soon drop off and leave an unclothed stem with a failing tip bud. The same effect can be found on branch tips of mature trees and may progress into dieback unless it is halted. Splashing raindrops appear to be the main method of local distribution of the spores. The spores in germination adhere to green tissues by appressoria formed at the tips of germ tubes. The host cells are then penetrated directly and toxic effects soon appear.

Anthracnose on pods consists of relatively small sunken spots, whose dark-green surfaces are covered with masses of pink spores in wet weather. Pod spots go deep, involving seeds and surrounding tissues. Leaves fall from severely affected trees; the fungus decays the branch tips and causes dieback; the tree loses much of its vigor and a poor crop results.

When attacks are severe planters commonly increase the amount of shade over cacao. Adding fertilizers and mulch to soils that do not contain abundant organic matter gives vigor to the trees and reduces the disease. Sometimes spraying the trees with copper fungicides controls anthracnose.

Investigators have found that some cacao selections appear to have high resistance to the disease. If, therefore, resistant clones are chosen, the best methods of culture, fertilizing and shading are adopted, and spraying is undertaken wherever necessary, losses from anthracnose may be practically eliminated.

Dieback and Charcoal Pod Rot

Diplodia theobromae, which causes a dieback and pod rot, is found nearly everywhere in the tropics and in bordering regions. This moderately vigorous parasite, which attacks approximately 500 different hosts, has been known for a long time. It is often regarded as a minor disease, but in conditions that favor its growth it can cause serious losses. It is more severe in poorly managed plantations than in well-handled ones where the trees are kept strong.

Trees that have been weakened by other diseases may eventually succumb to *Diplodia* attack. *Diplodia* has been found to follow primary infections by such organisms as *Phytophthora*, *Colletotrichum*, *Pellicularia* (koleroga), *Corticium* (pink disease), *Sphaeronema* and others.

Poor nutritive conditions that debilitate tissues are also forerunners of *Diplodia* dieback. The parasite enters weak twigs and branches, grows into and kills the infected parts, and causes a roughened decay. As the diseased twigs age, they blacken and are easily broken, but the *Diplodia* grows slowly down the branches. Ripe pods hanging on the tree also may succumb and these develop the dry charcoal-black decay. The surfaces of the black decayed tissues whether of branches or fruits, are marked by a roughness due to numerous deep-black fruiting bodies of the fungus embedded under the exterior.

The fungus apparently is not hard to control. Any cultural method that increases the vigor of the tree reduces *Diplodia* attack. Direct crop losses can be almost eliminated by regular and prompt harvesting of pods at maturity.

Other Diseases

There are a number of other diseases that affect cacao; some investigators think they may be as important as any and some seem to be increasing. Basal rots of trees are caused by fungi belonging to the Basidiomycetes, which attack cacao stumps and weak old trees. On the whole they give little concern. Among them are *Fomes* and others of the bracket-forming fungi, which spread from roots and other remains of old forest or jungle trees. Cacao trees that are infected by these decays should be removed. In the Gold Coast, *Armillaria mellea* infects cacao through roots that are actually in contact with the roots of diseased forest trees. It causes easily recognized and unusual perpendicular cracks in cacao trunks

at the ground line, or collar, and effects can be seen in the roots. It attacks many trees in temperate and tropical regions, but has never been recorded on cacao in the American tropics.

A serious root rot of cacao trees is caused by Ascomycetes, of the genus *Rosellinia*. Three species have been reported as occasionally severe on cacao. All are slow-spreading. The first outward sign of the trouble is wilting of the leaves. Eventually the tree dies. The sap wood is discolored at the base of the trunk, and roots will be found partly decayed and covered with dark or in certain cases light mycelium. Sometimes fungus strands penetrate deeply into the root wood. If the trouble is severe, it is advisable to isolate diseased areas with trenches, fell the trees, dig out the roots, and burn all the plant material. Areas thus cleaned up may be replanted after a year or two. Usually the replacements will grow without contracting the root rot.

Cacao is susceptible to attack by pink disease, thread blights, and seedbed damping-off, all due to members of the *Corticium* and *Pellicularia* fungi. Spraying with copper fungicides, pruning, sanitation and good drainage for seedbeds give reasonably good control of these troubles.

A number of different genera and species of parasitic flowering plants of the mistletoe family may be found on cacao. Some common ones are species of *Struthantus* and *Loranthus*. They need not be a problem and can be controlled by pruning and by removing the parasites by hand. If left growing on the branches, they drain the vitality of the tree and produce conditions favorable to parasitic fungi.

Plant Disease Situation in the United States

PAUL R. MILLER

Plant Disease Survey, Agricultural Research Service,
United States Department of Agriculture

"False Broomrape" and Leaf Curl of Tobacco in Kentucky

Two diseases, "false broomrape" of unknown cause, and leaf curl of virus origin, both unrecorded previously in the United States, have recently been found in burley tobacco plants in Kentucky. The leaf curl disease (Figure 1), identical in appearance with that described from India, was observed in several counties. Usually no more than one or two affected plants were seen in the field. It has been demonstrated that the disease is graft-transmitted.

The false broomrape was first observed in 1951 when outgrowths were noticed on the roots of burley tobacco plants in one county and were thought to be broomrape (*Orobanche*). In early summer of 1952, similar specimens were again diagnosed as broomrape, but the outgrowths did not get above ground. In the summer of 1953 a specimen from the same county was examined on which leaves had developed above ground and turned green. The outgrowths were evidently tobacco shoots developing from the roots of the plants (Figures 2 and 3). In some instances the mass of these shoots was suf-

Figure 1. Leaf curl of burley tobacco found recently in Kentucky.

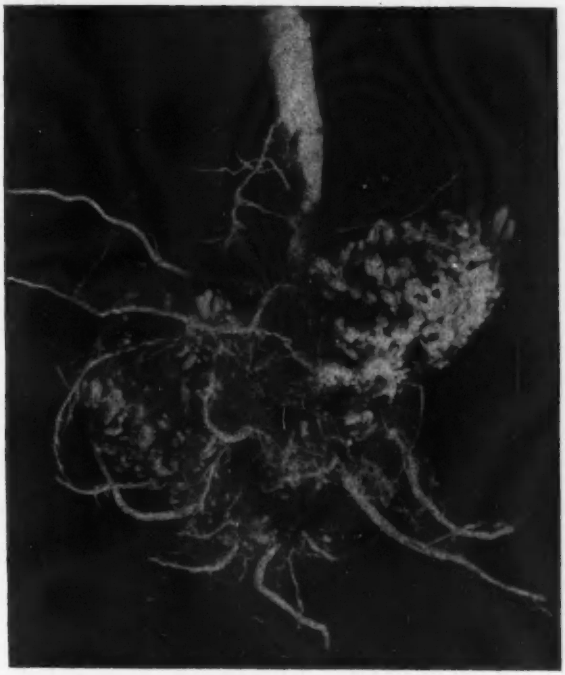

Figure 2. False broomrape of undetermined cause on burley tobacco in Kentucky. Numerous buds are developing from taproot and larger roots, starting evidently in early summer.

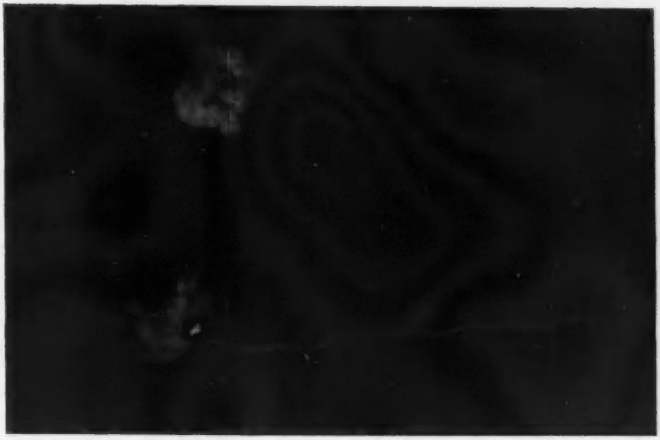

Figure 3. White undergrowth from the roots of a mature tobacco plant. The occurrence of only a few outgrowths on the roots such as illustrated suggests a late infection.

ficient to raise a considerable block of soil at the base of the plant. Eight of ten fields in one section of the county were affected; in another section only two of ten fields were affected. In some fields every plant examined had the outgrowths, varying from masses 2 or 3 inches across on the taproot of stunted plants to a few white shoots growing from either larger or small roots of plants that appeared to have made normal growth. The trouble has been reported from several additional counties in the same area.

The amount of injury caused has not been determined. Some small plants with a large mass on the roots seem to have been held back, but equally stunted plants can be found that are free. Some growers whose plants were nearly all affected had not recognized that anything was wrong. As to varieties affected, the trouble has been reported on Ky 16, Ky 26, Ky 35, Ky 41A, and Ky 57, and on several varieties of dark tobacco.

Nothing is known about the cause of this disorder. At first it was thought it might be due to a growth-regulating substance or insecticide, but its distribution, limited to one area of the state, would seem to eliminate such a cause. The fact that some plants have large masses of shoots, some of which are already decayed, while others have only the beginnings of buds, and still others show all intermediate stages, suggests the causal agent being spread throughout the summer. Such a suggestion indicates a virus as the cause. Mites have also been suggested but the disorder is not typical of the stunting of growing points caused by mites.

Carnation Pimple

A yellow pigment-producing bacterium was isolated from pimple-like spots on the leaves and stems of carnations (*Dianthus caryophyllus*) in Colorado. The pimples are about 1 mm. in diameter, appearing first in the upper parts of the plant, near the base of the leaf on the ventral side. More pimples form nearer the tips of the leaves. Leaves of severely infected plants may shrivel. There are no other visible symptoms. Sections of infected leaves showed evidence of bacteria within the xylem. In some cases some of the cells in the infected area were abnormally enlarged as compared to uninfected cells, which suggests that the pimples may result from hypertrophy due to the action of the bacteria upon the cells.

Pathogenicity of this bacterium has been demonstrated on the carnation varieties White Patrician and Miller's Yellow. The bacterium was also transmitted to *Dianthus barbatus* with similar results.

Characteristic pimple-like blisters appeared within four days on the stems and leaves of plants inoculated by applying bacterial suspension directly to the soil, whether roots were wounded or not. The results indicate that the organism can invade the tissue in the absence of wounds, and that it is well adapted to rapid migration or translocation to the upper parts of the plant. Plants inoculated with a foliage spray of bacterial suspension showed symptoms in four to eight days.

Apparently this organism has not been described previously as a carnation pathogen. On the basis of numerous morphologic and physiologic tests performed it appears to be closely related to *Xanthomonas oryzae* (Uyeda and Ishiyama) Dowson, but differs from it in the failure to produce acid from glucose, lactose and sucrose. The optimum temperature is 25° to 27° C. The organism is considered to be a new variety of *X. oryzae*.

Eckelrader Disease in Imported Cherries from Europe

A program of assembling all of the known varieties of sweet and sour cherries to test for resistance to the little cherry and albino viruses was initiated in 1949 at Oregon State College. All varieties were indexed on *Prunus serrulata* variety Shirofugen for ringspot, and on Bing sweet cherry for other serious virus diseases. Bing was selected as an index plant because symptoms of most of our known stone-fruit viruses are expressed on that variety.

All cherry imports were obtained through the plant introduction station located at Chico, California. Two separate introductions, when indexed on Bing, were found to be infected with a virus not previously known to exist in the United States. The

symptoms are very similar to descriptions of the " Pfeffingerkrankheit " of Switzerland or the " Eckelrader disease " of Holland.

Prunus avium, variety Esperen (P. I. 127371), originally from France, was grafted onto a Bing tree in March 1949. In July 1950 one of the scions and some of the adjacent Bing branches bore conspicuously narrow leaves with a roughened surface similar to that often associated with the deep-suture disease. Terminal growth was shortened, and the foliage of the branches appeared to be rosetted. The condition continued to spread through the Bing branches, and the presence of a virus disease was indicated.

Buds were taken from the diseased branches of the Bing trees and placed in branches of six-year-old Bing and Napoleon trees. Again, the symptoms showed one year later in a branch of the inoculated Bing tree, and two years later one-third of the tree was affected. Three years after inoculation, nearly every leaf on the inoculated tree was affected. The Napoleon variety appeared more tolerant of the virus, and only occasionally a terminal leaf developed symptoms or a leaf in a fruit spur became small and twisted. A few leaves with numerous enations in addition to other deformities were noted on a few terminals of the inoculated Bing branch, but for the most part, enations were not generally present on affected leaves. The oil spot mottles described for this disease by European workers were not observed at any time. Otherwise, symptoms produced on Bing clearly resembled those illustrated for the European disease.

The disease resembles rasp leaf in the reduction of size of leaves and severe effect on growth habit, and a possible relationship has been suggested. The two diseases were compared on Bing trees and found to differ greatly. Rasp leaf produces numerous enations on nearly every affected leaf, and the rate of movement of the causal virus through the tree is very slow. Three years after inoculation with rasp leaf virus, the leaves beyond a radius of two feet were unaffected whereas in a similar period the entire tree was affected with the introduced virus.

Prunus cerasus var. *umbraculifera* (P. I. 133841), originally obtained from the Arnold Arboretum, was also grafted onto Bing. A similar disease was found on the adjacent Bing foliage but the symptoms developed less rapidly and were not so severe.

All introduced sources of these two cherry varieties at the Chico Station and all subsequent propagations from them have been destroyed.

These results illustrate how easy it is to introduce plant viruses in symptomless carriers, and demonstrate that visual inspection, even of growing material, is not sufficient for their detection. The results further emphasize the need for systemized indexing of imported propagating plant materials before they are released.

Notes on Some Insect Pests in Lebanon

ADEL ABOU NASSER
Agricultural Service, Ministry of Agriculture, Beirut

THESE notes record some facts about two of the most destructive insect pests in Lebanon, namely, the Mediterranean fruit fly and the citrus rust mite. Although entomological investigations have not advanced in Lebanon to the extent desirable, the control of these two insects is considered to be a most urgent task.

Mediterranean Fruit Fly

The Mediterranean fruit fly (*Ceratitis capitata* Wied.) is the most destructive and widespread insect pest in Lebanon, especially in the northern and southern parts and in the Bekáa valley which is the most fertile agricultural area in the country. The insect damages all species of citrus, and is particularly serious on the late orange variety of Khoutmaly grown near Saida on the coast. Tangerines are usually infested in April and early May. The fly also attacks pears, especially the Oshia variety grown at 600–700 m. altitude, as well as peaches, cherries, prunes, late-ripening apricot, jujubes, medlar, Indian fig (*Opuntia ficus–indica*), and other deciduous fruits. Grapevine cultivated in the vicinity of citrus may be also attacked.

TABLE 1. *Results of examining fly punctures in fruit of Chamouty orange in the vicinity of Beirut*

Date of Examination	Total Number of Punctures Examined	Percentage of Fly Punctures			
		Sterile	With Abortive Eggs	With Larvae	
				Dead	Alive
3 August	150	88	9	0	3
26 August	284	74	11	1	14
15 October	176	45	23	3	29
28 October	245	66	8	2	24

The number of generations each year of the Mediterranean fruit fly in Lebanon varies from 7 or 8 generations on the coast to 5 or 6 generations in the mountain regions. On the coast, the fly appears at the beginning of May at Saida and Tyre in the south and at the end of May at Tripoli in the north. The average period of life for adults reared at Saida on orange fruit was 15 to 22 days in August and 34 to 45 days in September to November. The optimum temperatures for the development of the adult fly range from 13° to 24° C. Low temperatures at 12–13° C. slow down considerably its development, while higher temperatures at 33–35° C. shorten its life span. Hot dry winds are very destructive to this insect and exterminate many of the adult flies.

Orange fruits of the variety Chamouty punctured by the fly were examined in the vicinity of Beirut in August and October in order to determine the nature of the infestations. From the results summarized in Table 1, it will be seen that although most punctures were sterile, containing no eggs or larvae, still a high percentage of

the punctured fruits harvested in late August and October harbored living larvae. Such fruit would provide a means for the perpetuation and spread of the fly.

The control of the Mediterranean fruit fly in Lebanon has been effected by the use of a bait spray containing arsenate and molasses. The spraying begins as soon as the fly appears and is repeated 6 or 7 times at intervals of 7 to 8 days. Average results show that about 10 to 12 percent of the sprayed trees were infested, against 36 to 47 percent in non–sprayed trees.

In recent years, newer insecticides have been introduced. Experimental results indicate that lindane, DDT and organic phosphoric compounds are effective against this fly.

Citrus Rust Mite

The citrus rust mite, *Phyllocoptruta oleivora* (Ashm.), was first found in Lebanon about 1933 or 1934 near Djell–Ed–Dibe, Antélias, Tripoli, Saida and other places on the coast. It affects citrus fruit as well as young leaves and terminal buds. The mite has also been found on young branches and trunks of young trees.

The mite multiplies parthenogenetically in June to August and ceases to develop in January and February. On the coast, the incubation period of eggs averages 2 to 5 days during May to July. The larvae stage lasts 1 to 3 days in summer and 4 to 7 days in winter. The nymphal stage lasts 1 ½ to 3 days in summer and 5 to 13 days in winter. The period of the adult life does not exceed 23 days, averaging about 8 days. The number of generations each year cannot be determined exactly. Usually a new generation arises every 7 to 11 days in summer and 16 to 18 days in winter.

Lime sulphur spray has been used successfully in Lebanon for combating this mite. White oil, especially Volck oil spray, was also found to be very effective.

Outbreaks and New Records

United Kingdom

T. R. PEACE
Forest Research Station
Forestry Commission, Farnham, Surrey

Unusual Outbreaks of Pine Looper Moth

The pine looper moth, *Bupalus piniarius* L., is indigenous to Great Britain and is widely distributed in pine areas in all parts of the country. Although this species is a serious pest on the continent of Europe, where it causes recurrent and severe defoliation to pine woods usually on sandy soil types in low rainfall areas, it has not until now caused damage in British forests. In the summer and autumn of 1953, however, the pine looper completely defoliated about 150 acres of 32-year-old Scots pine (*Pinus sylvestris*) plantation in the forest of Cannock Chase (Staffordshire) and damaged to varying degrees of severity a much larger area of the same forest. Indices of population were obtained by counting pupae in square yard quadrats and these counts revealed mean numbers of pupae of up to 285 per square yard in the worst areas. In Culbin Forest (Morayshire) where the looper population has been rather high since 1952, although no defoliation has so far occurred counts revealed a mean figure for the main block of woodland of about 20 pupae per square yard. This is significantly greater than the figure of 6 pupae per square yard which continental experience indicates as being abnormally high and threatening future defoliation.

Plans have been prepared to make aerial applications of insecticides over 2,500 acres at Cannock Chase and 3,500 acres at Culbin Forest in the late summer of 1954. The treatment is to be carried out by fixed-wing aircraft which will apply 1 lb. DDT in 3 gallons of spray per acre.

A country-wide survey of susceptible pine areas did not disclose any other areas where damage had occurred or appeared likely in 1954 and consequently no other areas will require control treatment. The present outbreaks show, however, the necessity of annual surveys of the incidence of the pine looper, which has so suddenly changed from a potential menace to an actual pest of British pine forests.

United States

Plant Pest Control Branch
Agricultural Research Service
United States Department of Agriculture

Further Outbreaks of the Armyworm

The armyworm, *Pseudaletia unipuncta* (Haw.), which caused widespread damage to cereal and forage crops in the eastern part of the United States in 1953, has occurred in outbreak proportions in that area again in 1954. Up to the middle of May the heaviest concentrations of the insects had been reported from the States of Tennessee, Kentucky, and Arkansas, in southern Missouri and in northern areas of Louisiana, and Mississippi. Extensive control measures were employed to combat the heavy infestation in oats and other small grains in Louisiana and Mississippi. Populations ranged up to nine per square foot in small grains in Missouri, and up to 50 per square

foot in some areas in Arkansas, where a high percentage of the small grain acreage was treated for control of the pest. Both aircraft and ground equipment were used in a widespread control effort in Tennessee.

By 20 May, moth flights had been observed as far north as Iowa and Pennsylvania and young larvae had been reported in several states including Illinois, Maryland and Delaware.

Mexican Fruit Fly Found near California Border

The Mexican fruit fly, *Anastrepha ludens* (Loew), a pest of citrus which is now known to be present in the United States only in the extreme southern part of Texas, has recently been found near the California border in Baja California, Mexico, an area of that country in which this pest had not previously been recorded as being present, though it is known to be of general occurrence in parts of the mainland of Mexico.

A female adult was found on 22 January in the vicinity of Tijuana, Mexico, and on 9 April a male adult was trapped in a backyard sapote tree in Tijuana, less than one mile south of the California border. Two empty pupal cases were found when the soil under that tree was sifted.

An extensive survey for this insect is under way in that area and a precautionary spray program has been undertaken by the California State Department of Agriculture in co-operation with the United States and Mexican authorities.

PLANT QUARANTINE ANNOUNCEMENTS

Australia

The following summary of Quarantine Proclamation No. 52A, furnished by the Director of Plant Quarantine, Department of Health, Commonwealth of Australia, is to replace the abstract published in this Bulletin, *II* : 95, 1954.

Quarantine Proclamation No. 52 A, published in the Commonwealth of Australia Gazette, 31 August 1953, prohibits or restricts the importation of certain articles and certain animal products likely to introduce diseases or pests affecting animals or plants.

Among the articles and animal products whose importation is either prohibited absolutely or restricted by this Proclamation, the following are either of plant origin or of concern to plant production:

Imports prohibited:

1. Used and second-hand beehives.
2. Animal manure, other than guano.

Imports restricted:

The articles or products listed below shall be subject to such treatment and requirements as are prescribed by the Quarantine (Animals) Regulations, and in certain cases may be imported only from countries specified. Such articles or products mentioned hereunder except straw packing shall not be imported on a vessel used in navigation by air.

1. Fertilizer and stock feed of animal origin, permitted only from New Zealand. (Regulations prescribe a certificate to accompany the goods).
2. Fertilizer and stock feed derived from fish, permitted from any country. (Regulations prescribe a declaration by the manufacturer that the goods were derived solely from fish and are packed in new bags).
3. Fodder, hay, chaff, and straw, permitted only from New Zealand. (Regulations prescribe that the permission of the Minister must be obtained prior to importation).
4. Straw packing and other unprocessed vegetable packing with goods permitted from any country. This item if from New Zealand or U. S. A. is exempt from the provisions of the Regulations. (Regulations prescribe destruction or detention on arrival for 90 days from the date of shipment unless accompanied by disinfection certificate as laid down).
5. Used or second-hand bags (including woolpacks and bagging), permitted from any country. Bags containing merchandise and bags from New Zealand or U. S. A. which have not been used in any country other than those countries and Australia are exempt from the provisions of the Regulations. (Regulations prescribe detention on arrival until the 90th day after the date of shipment).

In addition to the above, a number of animal products and articles in relation to the care of animals are listed in the Proclamation as subject to these restrictions.

Denmark

Supplementary Order of 24 May 1954 from the Ministry of Agriculture supplements the Order of 27 April 1953 relative to the importation of plants and parts of plants by introducing new provisions governing the importation of carnations in order to prevent the introduction of *Tortrix pronubana*. In addition to requirements provided in the Order of 27 April 1953, carnation plants and parts thereof imported for vegetative propagation must originate from a place which has been systematically inspected by the plant protection service of the exporting country and has been found to be free from this insect pest. Cut carnations imported for commercial purposes must be accompanied by a phytosanitary certificate attesting that the shipment has been inspected before embarkation and found free from the insect. These restrictions will come into force on 1 August 1954.

Federal Republic of Germany

Ministerial Notice of 12 March 1954, published in the *Bundesanzeiger* No. 51, 13 March, exempts from prohibition the importation of cut carnation blossoms, and blossoms, foliage and twigs of deciduous dicotyledonous plants during specific periods. These materials may be imported from Belgium, Denmark, England (excluding Dominions and possessions), Finland, Ireland, Luxembourg, Netherlands, Norway, Scotland and Sweden from 14 March 1954 until further notice, if they were actually grown in those countries. Each consignment must be accompanied by a phyto

sanitary certificate, indicating the origin of the consignment. The importation of such consignments is also permitted from other countries from 14 March to 14 April 1954, if they were effectively fumigated or otherwise disinfested before entry.

If the plant inspection service finds that such imports are repeatedly infested by carnation tortricid (*Tortrix pronubana*) or San José scale (*Aspidiotus perniciosus*), the exemption for any specific country indicated above may be revoked.

Previously the importation of cut carnations and blossoms, foliage and twigs of deciduous dicotyledonous plants was prohibited between 15 March and 30 November of each year.

United Kingdom

The Importation of Plants (Amendment) Order, 1954, which will come into operation on 16 September 1954 and remain in force until 30 April 1955, requires a certificate, in addition to the one prescribed in the Importation of Plants Orders, 1947 to 1953, for all consignments of living plants and parts thereof, except those consisting wholly of potatoes or forest trees or of plants of which the period of active growth had ceased before 1 June 1954. This certificate is to attest that the plants included in the consignment were examined during growth and found to be free from injurious pests and diseases including virus diseases.

The Importation of Plants Orders, 1947 to 1953, require all living plants and parts thereof (except seed) imported for planting to be accompanied by a prescribed certificate of health based on inspection of the plants made within 14 days prior to the date of shipment.

United States

Administrative instructions prescribing the method of treatment of garlic from Algeria, Hungary, Italy, Morocco, Spain, and Yugoslavia, published as Foreign Quarantine Notice 319.56–2h in the *Federal Register* Vol. 19, No. 37, 24 February 1954, specify that all shipments of garlic (*Allium sativum*) imported under permit from the above-mentioned countries must be fumigated upon arrival with methyl bromide in approved vacuum chambers under the supervision of a quarantine inspector. Such entry will be limited to the ports listed below or any other port named in the permit:

Baltimore, Maryland	Norfolk, Virginia
Boston, Massachusetts	San Juan, Puerto Rico
Los Angeles, California	San Francisco, California
New Orleans, Louisiana	Seattle, Washington
New York, New York	

These instructions were issued because garlic from the countries named above has frequently been found infested with injurious insects, including *Dyspessa ulula* (Bkh.) and weevils of the genus *Brachycerus*, not known to occur in the United States, and because ordinary inspection methods are inadequate to ensure such importations being free from infestation. The instructions became effective 23 February 1954.

NEWS AND NOTES

European Plant Protection Organization

The fourth meeting of the Council of the European Plant Protection Organization (EPPO) was held in Paris on 28 April 1954. All of the 20 Member Governments, including Sweden, which has recently joined, were represented; also, as observers, the Organization for European Economic Co-operation (OEEC) and the *Comité européen de zoologie agricole*. The Progress Report for 1953–54 was approved and will shortly be published.

Under the terms of the EPPO Convention, the Chairman and Vice-Chairman of the Council hold the same offices on the Executive Committee which in addition includes five representatives of Member Governments. The three-year mandates of Denmark, Italy and Switzerland on the Executive Committee, and of the Chairman and Vice-Chairman, expired with the present meeting of the Council. It had been proposed by the Executive Committee that the three vacancies should be offered to Ireland, Portugal and Sweden, but the Swedish delegate said that his Government would prefer to regard Denmark as representing the Scandinavian region. The Council accordingly re-elected the Danish representative and appointed Ireland and Portugal to fill the two remaining vacancies. Also, to avoid too serious a disturbance in the work of the Committee, the mandates of the Chairman and Vice-Chairman were prolonged for a further year.

A Working Party on Seed-borne Diseases has been convened to meet in Paris 2–3 July 1954, in collaboration with the International Seed Testing Association. The underlying objective of the Working Party will be to agree on recommendations which might be made to governments with the object of clarifying the position concerning phytosanitary regulations governing international traffic in seeds.

On 21–23 September 1954, EPPO, in agreement with the Belgian Government, is convening in Gembloux, Belgium a further international conference on muskrat control. During the past few years there has been increased interest in several European countries in the subject of muskrat depredations. A scheme of training for muskrat control officers was recently submitted by EPPO to the OEEC and has been approved by that body for financial assistance from the European Productivity Agency Fund which it administers. Under this scheme, countries interested may send muskrat control officers to Germany for short courses of intensive training in the spring and autumn, and German specialists will visit the countries concerned to follow up the work in the succeeding year.

Another EPPO-sponsored scheme which has been approved by the OEEC for financial assistance from the European Productivity Agency funds relates to the infestation of grain, etc., during storage and international transport. Under this project, two specialists, from England and the Federal Republic of Germany respectively, will visit the principal grain exporting and importing countries of the world, to enquire into their systems and make recommendations which might have the effect of reducing some of the heavy losses at present sustained by grain in transport between countries.

At the next meeting of the Executive Committee, proposals will be considered for convening technical conferences on the potato root eelworm, San José scale, and xyloporosis – a serious virus disease of citrus which threatens the Mediterranean area. The Committee will also take final steps for appointing a small working group to consider the unification and simplification of phytosanitary procedure and to make recommendations.

Roma - Tip. del Senato del dott. Giovanni Bardi